CLASSIFICATION, DESIGNATION, IDENTIFICATION = CONFUSION

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CLASSIFICATION, DESIGNATION, AND IDENTIFICATION = CONFUSION

Prior to discussing vegetation classification systems in the Pacific Northwest I must define three concepts: classification, designation, and identification. Designation of land area and a means for identifying landscape items have often been incorrectly called "classification" systems.

Classification: the systematic arrangement of plant communities into groups or categories based upon some definite scheme. Each category is an abstract concept whose characteristics are derived from similar kinds of plant communities thus homogeniety is strived for. The characteristics are averages of samples taken from different locations. Plant communities are assigned to a category according to rather precise rules such as similarity in dominant species, similarity in productivity, similarity in sites, or other characteristics. Example: Ponderosa/wheatgrass and pronderosa/fescue associations of Daubenmire in northern Idaho plus ponderosa/wheatgrass and ponderosa/fescue community types of Hall in the Blue Mountains, can be grouped into a Ponderosa/bunchgrass series based on similarity in climax ponderosa pine and life form of ground vegetation.

Designation: delineation of specific land area, such as physiographic province, which has a given set of characteristics. This is not an abstraction based upon sample averages but a description of real entities as they occur in combination. Usually, heterogeniety is expected. Example: The Columbia Plateau province is generally composed of basaltic material above 1500 feet elevation with rolling, basin like form extending from the base of the Cascades in eastern Washington and Oregon into southern Idaho below the granitic Idaho batholith. Within this province are the Blue Mountain section and the Columbia Basin section - extremely differnent kinds of land. Within the Blue Mountain section are the dissected basalt and plateau land sub-section located in the northern Blues and the lacustrine plains sub-section around Baker - a combination of steep, rough topography and flat, lake bed topography in the same gemorphic section.

The term "classification" has been applied to this kind of physiographic organization - province divided into sections each of which is divided into sub-sections - a hierarchial scheme. However, this system differs from plant taxomony or plant community classification in two very important ways: 1.) Plant classification has the objective of grouping similar communities together such that all associations in the climax ponderosa series have the common characteristic of ponderosa pine being the sole climax tree. Physiographic designation has the objective of delineating difference within the section such that each sub-section is significantly different from all other sub-sections. 2.) Plant classes or categories are abstract while physiographic categories are real areas of land.

A ponderosa pine/wheatgrass type of community can occur in many different locations - British Columbia, Oregon, Washington, Idaho, or Montana. It is similar to ponderosa/Idaho fescue and ponderosa/Arizona fescue. All three can be combined - classified - into a ponderosa/bunchgrass category with the common characteristics of climax pine and bunch form of grass understory. On the other hand, the "Dissected Basalt and Plateau Land sub-section" only occurs in the northern Blue Mountains. It can not be combined with other sub-sections to create a "section" having similar characteristics because it is forever tied to the Blue Mountain Section by location. It has been designated because it is different from all other sub-sections in the Blues. It is similar to the "Dissected Basalt Plateau sub-section" of the Wallowa section and the "Dissected Plateau Lands sub-section" of the Upper Basin and Range Section, all of which are in the Columbia Plateau Province.

Designations in the Pacific Northwest listed by Franklin and Dyrness:

Physiographic provinces - 15 kinds which differ from the descriptions already given. For example: Olympic Peninsula, Coast Ranges, High Cascades.

Vegetation Regions - 7 kinds which were generally independent of the physiographic provinces. For example: forested W. Washington and N. W. Oregon, forested S. W. Oregon, shrub-steppe with sagebrush of Central and S. E. Oregon.

These are not "classification" units. They are areas of land designated on a map.

Identification: a system of assigning an identification to landscape units. The identification system does not require either systematic similarity or objective difference between groups. Identification can be applied to classified plant communities, to vegetation that has not been classified, or to landscape items other than vegetation such as water, rock, ice, or administrative sites. The objective is to utilize computer capability to group items using a system suitable for identifying any kind of landscape item at any degree of precision. Example: EARTS satellite imagery or aerial photographs at 1/60,000 will reveal coniferous vs. desiduous forest, grassland, water, etc. Resource photography at 1/15,840 or 1/12,000 will reveal tree species, kind of grassland or shrubland, and certain characteristics of water or rockland. Finer delineations can be made with field evaluation and ecological study.

An identification system can be used to group similar items such as ponderosa pine, Douglas-fir, and white fir into the coniferous forest group thus it appears to have a "classification" nature. However, it is not a classification system in the sense of objectively grouping similar plant communities according to a definite scheme such as similarity in species composition. It must also identify non-vegetated items such as water and rock areas. The identities must not be tied together into a set framework, but must be capable of being grouped together in any way needed by the land manager.

Single Level and Hierarchial Classification:

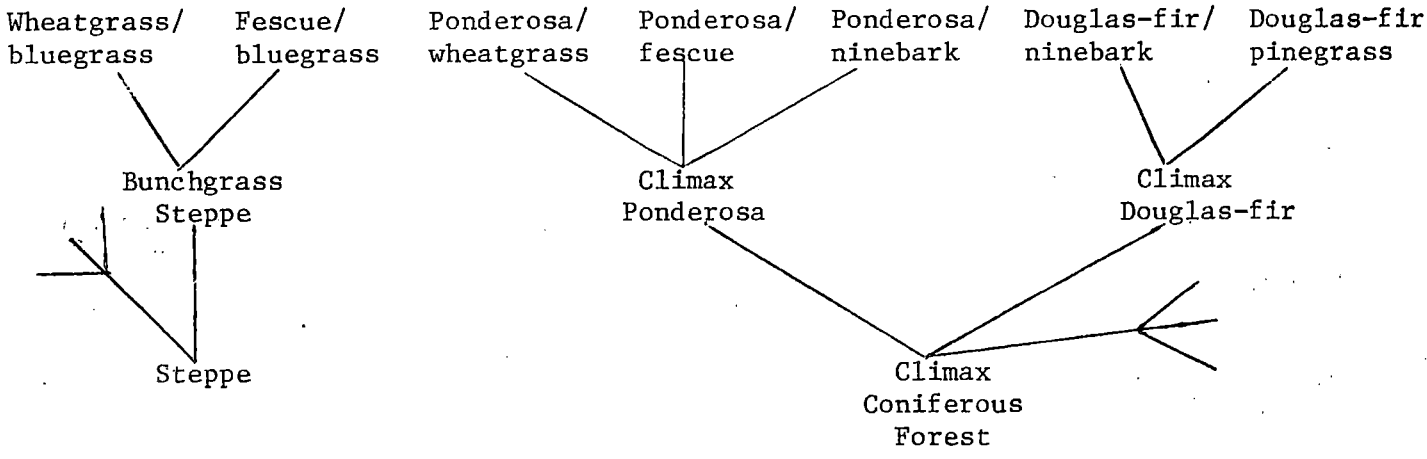
A classification system can be designed around a single level or around multiple

levels in which a hierarchial relationship is required. A hierarchial system has much more precise rules of combination than does a single level system.

Single level classification systems can utilize several characteristics for grouping. They only require homogeneity within each classified unit. Samples are grouped together according to similarity in attributes such as species dominance, productivity, land features, or a combination of these. Thus the classified unit derives its characteristics from the samples making it up. It becomes a conceptual entity in its own right, independent of any other classified unit.

"Independent of any other classified unit" is the key differentiating point between single level and hierarchial systems. Single level classification can have units similar to each other but it does not require similarity. Criteria considered in classification can be different between units. In addition, units can be classified according to more than one kind of critera. They may be developed according to similarity in floristic composition, and/or land features, and/or climatic criteria. For example, wheatgrass/bluegrass communities can be classified by soil depth of 8 - 14 inches and over 14 inches and slopes greater than or less than 25%. Low sagebrush communities can be classified by soil depths of 6 - 10 inches and over 10 inches and slopes greater or less than 35%. Big sagebrush communities can be classified by slopes greater or less than 25% because soil depth is already reflected by dominance of big sage. Soil depth criteria changed between units and was not needed in another; slopes changes between units. Criteria used reflect management needs for revegetation, animal movement, and herbage production.

Hierarchial classification requires that a single, common characteristic be used for grouping. Most hierarchial vegetation systems use plant species. The system requires similarity between units because units are grouped together at a second level according to a common element; therefore, they are all dependent. They are further grouped together at a higher level by a common element continuing the dependence. The following diagram illustrates this inter-dependence.



Vegetation types making up climax ponderosa pine all are dependent in having ponderosa as the sole climax dominant. Types making up climax Douglas-fir are dependent in having fir the climax dominant even though ponderosa is a high successional tree on both types. The step from basic unit to mid unit resulted in elimination of ground vegetation criteria; likewise, the step from mid to bottom unit resulted in elimination of tree species. The single, common characteristic was vegetation.

The single characteristic nature of hierarchial systems is their primary weakness. Types can be summarized in only one way - according to that characteristic. For example, we can not determine the occurrance of ponderosa pine because it does not occur as a successional tree in all climax Douglas-fir types; it also occurs in some grand fir climax types. We can not show the great similarity between Douglas-fir/ninebark and ponderosa/ninebark: wood production is only about 15% less in ponderosa, tree regeneration is equally difficult in each, and livestock forage production is rather low in both. These two types are far more similar to each other than is ponderosa/ninebark to ponderosa/wheatgrass, the latter is not even commercial forest land! And nowhere can we estimate the great similarity between ponderosa/wheatgrass and wheatgrass/bluegrass--they are not even in the same formation--yet the difference is only a few trees per acre. Ponderosa/wheatgrass is the transition from wheatgrass/bluegrass to forest, it is a savanna defined by at least four trees per acre - three trees per acre makes it wheatgrass/bluegrass!! Each level in a hierarchial system greatly reduces the precision of definition and therefore dilutes management interpretation.

Single Purpose and Multi-purpose Classification:

Single purpose classification deals with grouping plant communities according to one characteristic such as species composition. It is, of course, required in hierarchial systems.

Multi-purpose classification attempts to consider more than one characteristic in the grouping. It is, of course, limited to single level systems. For example, plant communities might be classified according to species, productivity, sensitivity to grazing, and reaction to revegetation. Or they might be classified by precipitation zone, soil, and landform similar to range site delineation in the great plains. (See pp 9 & 10)

Vegetation Classification in the Pacific Northwest:

Vegetation classification has followed the concept of Daubenmire and his habitat type. He has clearly emphasized classification of basic units rather than a comprehensive hierarchial system. In fact, he used only two level, association and series, in forest vegetation and no clear-cut hierarchy in steppe vegetation.

The basic unit is the association or habitat type. He recognizes different categories of associations:

Modal Association: the plant community characteristic of a certain climate growing on a fully developed soil (loam, undulating to rolling).

Topo-edaphic Association: plant communities different from the modal due to restraints caused by soil, topography, or a combination of these.

Zootic Association: plant communities different from the modal due to influences of animals.

Special Association: plant communities different from the modal due to unique environmental constraints which cause small, isolated types of communities of limited distribution.

The basis for classification is similarity in species composition of the entire plant community in climax. Further, climax plant communities are assumed to recur, with minimum differences in species composition, throughout an area, on different aspects, slopes and soils, and at different elevations. Thus, each association is considered to represent a reasonably discrete kind of habitat - a habitat type. Similarity in climax vegetation is assumed to represent similarity in effective environment. A habitat type may occur at low elevation on a north slope and at higher elevation on a south slope due to compensating factors of temperature and effective moisture.

This discrete community concept is quite different from another currently popular classification system known as the continuum. Most advocates do not evaluate species composition in climax, instead, they accept current vegetation (in apparently undisturbed condition) as the basis for ordination. They point out continuous variation in environmental factors such as aspect, slope steepness, soil characteristics, elevation, temperature, and precipitation which they assume causes continuous variation in plant community species composition.

The discrete community is popular in the Pacific Northwest because plant communities do tend to repeat themselves over the landscape and in different environmental situations. But perhaps more important, the discrete community concept can be applied to solve management problems. The habitat type provides a point of reference. One can map habitat types where he can not map a continuum gradient. We can characterize successional stages and productivity of the mapped units. We can provide predictions of how a habitat type (mapped unit) will react to management. We can provide easy-to-use criteria for judging range condition.

I have modified the habitat type concept of Daubenmire for classification of associations for National Forest use. In addition to similarity in species composition in climax, three other criteria characterized each classified unit:

1. A "habitat type" had to be different from all other types for management.

2. It had to be identifiable in the field under any degree of disturbance.

3. It had to have similarity in productivity.

My units are not called habitat types because they are not equivalent to Daubenmire's units; mine are called "plant community types."

For example, Daubenmire described the wheatgrass/bluegrass habitat type on south slopes and the fescue/bluegrass type on north slopes. We have found that: 1. We can not determine which type to map on an east or west slope in poor condition.

2. The density and composition of wheatgrass plus fescue (using the loop frequency method) is not significantly different between the two types; therefore, range condition criteria are similar. 3. Slope steepness and soil depth are more important influences on species composition than is aspect. Bunchgrass types were grouped by vegetation dominance plus environmental qualifiers: slope was designated as greater or less than 25% and soil depth was divided into three groups: less than 8 inches, 8 to 14 inches, and over 14 inches. We have bunchgrass on scablands; shallow soil, "flat" slope; shallow soil, steep slope; deep soil, flat slope; and deep soil, steep slope. Criteria for soil depth and slope steepness are directly related to management: Slopes over 25% can not be effectively revegetated by plowing and drilling and livestock increasingly resist walking up slopes over 25%; soils less than 8 inches deep can not be revegetated, revegetation is tenuous between 8 and 14 inches deep, and generally good on soils over 14 inches deep.

Philosophically, I differ with the concept of "discreteness" of associations. My view is a continuum in climax vegetation. I therefore sample for variation within community types; statistically test regressions of environmental factors on various characteristics such as dominance of a species, herbage production, or tree site index; provide means and confidence intervals for all data to emphasize the range of variability within the community type; and freely admit that the community type will fit conditions in the field only about 70% of the time - the other 30% will be a combination of two or more types - the continuum intergrade.

Our difference stem from our different objectives and experiences. Dauby's classification system is totally valid; his habitat type concept has been proven correct; he understands and discusses continuum tendencies. His objective has been to develop a system of classification. My objective is to apply that system to solve land management problems. Our people must map and name each acre of land regardless of whether it happens to represent a modal habitat type or an intergrade between types - our problem is not in identifying typical sites, but dealing with non-typical areas which make up 30-40% of the land base. We must deal with problems wherever they occur. The logger cares not whether he messes up a typical or a non-typical area; cows care not whether they overgraze a modal or a non-modal site. The land manager must be furnished with guides to both the typical and non-typical land he manages because he must deal with each and every acre.

Hierarchial classification has not been big in the Pacific Northwest. It might look as follows for Daubenmire's forest area:

Formation - coniferous forest, non-forested steppe; based upon life form.

Series - Designated by the dominant climax tree; based upon similarity in environmental factors favoring a common tree species for all associations.

Examples: Ponderosa pine series, Douglas-fir series. Steppe vegetation was not classified into series.

Associations - Designated by the dominant species in tree, shrub, and herb layers; based upon similarity in species composition of the plant community. Examples: ponderosa/snowberry, ponderosa/ninebark of the ponderosa series; Douglas-fir/snowberry, Douglas-fir/ninebark of the Douglas-fir series.

Ecoclass - an Identification System

Land managers have found a need for identifying and mapping basic landscape resources and their characteristics with or without a classification system. Most of our vegetation has not been classified. Such an identification system should provide for:

1. Flexibility because most basic units (habitat types or community types) are not yet known. It must be able to accept any level of information. It must be open ended to accept new information.

2. Comprehensive description of the identified item.

3. Identification of stable or climax rather than rapidly changing successional conditions.

4. A means for combining similar or dis-similar items (plant communities) together (a classification procedure) in any way to meet the needs of the land manager.

5. Computer compatability.

6. As much direct interpretability as possible (coding that can mean something to the reader).

Ecoclass has been developed for vegetation and aquatic resources. Land identification has not yet been accomplished. Four levels of precision are provided. These resemble a "classification". However, they are not based upon ecological similarity of the items, upon the same scheme of grouping (such as floristic similarity), upon the same accuracy between groups, or even upon the same kind of information between groups.

Formation: Based upon information available from EARTS imagery or 1/60,000 photographs. Life form of plants or general land characteristics. Coniferous forest, shrubland, water, non-vegetated land, cities.

Association: Based upon resource photography, existing maps, casual observation. Expressed as kind of tree species in forest, droughtiness class in shrubland, nature of non-vegetated areas such as rock, ice, lava, or kind of water.

Series: Based upon field examination but not requiring an ecological investigation or classification. Expressed as species groups in a vegetation association, soil or geological character in non-vegetated areas or water characteristics.

Community/Habitat Type: Based upon classification of plant communities or other items. The most precise designation. Requires field interpretation. Expressed as: Douglas-fir/pinegrass habitat type, mixed conifer/pinegrass - ash soil community type, sub-alpine steep scoria dwarf juniper "non-vegetated" type of the Willamette N. F., or Estuary system of bar built, well mixed saline water, tidal exposed sandy bottom on the Pacific Coast.

Characteristics of the identification system may be illustrated as follows:

Present timber maps or aerial photographs indicate an area on the Mount Hood N. F. is dominated by Douglas-fir with moderately abundant western hemlock understory. The area is coded CH - C for Coniferous forest, H for Hemlock, because it will be the climax dominant. Later, stand examination reveals ground vegetation is dominated by rhododendron. This is Series S3 - S for shrub and 3 for the third group of shrubs characterized by rododendron. This Series designation is added to CH to form CH S3 as an Ecoclass identification. We know that study on the H. J. Andrews Experimental Forest has classified four habitat types containing rhododendron with western hemlock. We now have an idea of general ecological characteristics of this stand in addition to timber information. After ecological work in the Mount Hood Forest has characterized and classified plant communities, we again visit the stand and find salal dominating the low shrub layer which identifies the site as Hemlock/rhododendron/salal habitat type and we add a 12 to the mapping identifier giving CH S3 12 as the most precise Ecoclass identification.

Vegetation Classification and Land Management Needs

This paper has dealt with classification of vegetation into groups generally called habitat types. But how do these relate to solving land management problems? We have found five kinds of information are needed to make a sound land management decision:

1. Potential of the site; its reaction to treatment, opportunities and limitations of treatment, and productivity potential. The habitat type or community type.

2. Current vegetation condition (or timber stand condition); dominant species, volume per acre, size, range condition, etc.

3. Land situation: Steepness of slope, aspect of slope, position on the slope, elevation, soil type and characteristics, trafficability, etc.

4. Current use of the area: primary livestock range, critical game winter range, foreground landscape area, endangered species area.

5. Juxtaposition of the area: in relation to roads, fences, other vegetation types, other land situations, rivers, etc.

Note that vegetation classification is only one of five items. It will not solve land management problems; it can only refine planning and treatment of the land. For example, mixed conifer/pinegrass can produce 300 pounds of usable forage and can be commercially thinned to produce a combination of livestock feed and timber products. However, we can not commercially thin stagnated reproduction averaging 4 inches DBH, we must pre-commercially thin it. Following pre-commercial thinning, we can not utilize the 300 pounds of forage due to physical imparement by the down trees. Reduction of slash will facilitate animal movement but we can not accomplish this on slopes over 40% due to unsuitable terrain for vehicles. We would not desire complete thinning if the area were needed for big game hiding cover, and we would probably not thin at all if the stand were located in a draw adjacent to grassland winter range for elk.

Rangeland Classification and Ecological Classification

"Classification" in rangeland evaluation is primarily directed toward developing condition guides, a single level system. Condition guides are used to interpret successional status of current vegetation. This interpretation is usually done for each mapping unit in an area.

Difference between ecological classification and rangeland classification as they have developed in the USA is application on the ground to each and every acre. Academicians with no land management responsibility have developed ecological classifications. Land managers with mapping, land treatment, and assessment of treatment results have developed rangeland classification. While agreeing upon desirability for "ecological classification", their needs and points of view have originated from opposite ends of a spectrum: pure theory at one end and pure pragmatism at the other. For example, Daubenmire recognizes about 50 non-forest/habitat types in Washington, whereas the SCS recognizes over 150 range sites. SCS personnel have mapped central and eastern Washington for existing vegetation and range condition as a basis for improving land management on ranches. They had to interpret each and every acre for range condition. They required about 150 sets of criteria - range sites - to do this job.

Principles developed by academicians have been modified and applied to rangelands. Both the discrete community and continuum in climax concepts have been used with equally good results. Generally, continuum approaches have been predominant in undulating to rolling country such as the great plains and central and eastern Washington State. Discrete communities have been most useful in hilly to mountainous country such as central Oregon and Idaho.

Concepts of Rangeland Classification

Climax vegetation has generally been the basis for classifying sites and the reference point for estimating condition. This does not say that climax vegetation is best for a given kind of activity or that it should always be the goal in management. Climax conditions are not generally suitable in forest rangeland. Tree cover greatly influences ground vegetation (range "condition") but is subject to timber management influences rather than range management treatment. Secondly, most highly productive forest ranges are successional in nature, having been maintained in a productive state by underburning. Examples are the southern pine/grass and pine/pinegrass types in the greater Pacific Northwest.

Range Condition is a means of classifying successional status of current vegetation. It is generally assumed to be directly related to livestock use, an assumption often in error. If livestock overgraze an area, they will kill the most palatable plants resulting in successional vegetation which is termed fair or poor range condition. If livestock use is reduced, these palatable plants tend to re-colonize the site resulting in secondary succession which is termed upward range trend. The implication is that poor range condition is the result of past adverse livestock management and that a change in management will cause an upward trend toward climax or "good" condition. This concept is most appropriate in climax grassland types, fairly appropriate in shrub/grass types, and quite misleading in forest ranges.

On forest ranges, increasing tree cover causes a decrease in density and herbage production and a shift in species composition of ground vegetation - a "downward range trend" - which no amount of livestock management will alter. Thinning forest stands will cause an increase in density and production, and a shift in species composition - an "upward range trend" - independent of livestock management. Further, the more productive forest sites which have been maintained in open pine and grass by underburning have a "climax potential" of dense hardwoods in the south and fir in the Pacific Northwest. "Climax" ground vegetation is only 1/10 as productive as that in the successional fire status, hardly a suitable basis for rating range condition. In these cases, range condition is rated according to density of tree cover instead of climax.

Continuum in Climax has been used most often in the great plains. No one attempts to map or characterize continuum gradients. Instead, the gradients are divided into segments based upon precipitation, soil, and landform. Thus a range site is depicted as: 14-16" pz. sandy outwash; 14-16" pz. stoney loam rolling hills; 16-20" pz. sandy outwash; 16-20" pz. stoney loam rolling hills, etc. (pz. = precipitation zone).

In general, a 25% difference in productivity or species composition is required to establish a new range site. Therefore, criteria of the precipitation zone (pz) varies, soil conditions vary, and landform characteristics vary between sites. Range sites are generally named by land features to facilitate identification in any stage of succession including cropland or former cropland which has had all native vegetation removed.

Note that three criteria characterize each site. A hierarchial classification system can use only one of these if a range site is to be assigned to a higher category.

Discrete Community concept has been used in mountainous country exclusively because continuum gradients are often incompletely developed, the number of gradients greatly increases, and because we have not been able to characterize these gradients effectively. Daubenmire's habitat type concept has been modified so it will apply to as many land acres as possible. Not only must species composition be similar within a type but also density of species and productivity. Classification is accomplished by adding numerical values to each species and establishing types based upon prescribed variability in density, composition, and production.

In general, 25% variability has been strived for. Range sites are usually named or described by a combination of vegetation and land features to facilitate recognition in any stage of succession.

Sampling for Rangeland Condition

Determination of rangeland condition requires a quantitative rather than a qualitative approach, another significant difference between recognizing habitat types and evaluating range sites. The area in question is sampled. Two approaches have been used: estimation of weight by species with clipping checks and measurement of plant density with a small loop. The primary problem inherent with condition sampling is observer error. A person estimating condition in the field is seldom the one who developed the range site condition guide. Therefore, a field man must

use and interpret the sampling system in the same way it was originally used to develop the guide.

In general, however, range condition can be estimated by reconnaissance quite well by rating the area under question by one of four condition classes: good, fair, poor, and very poor.